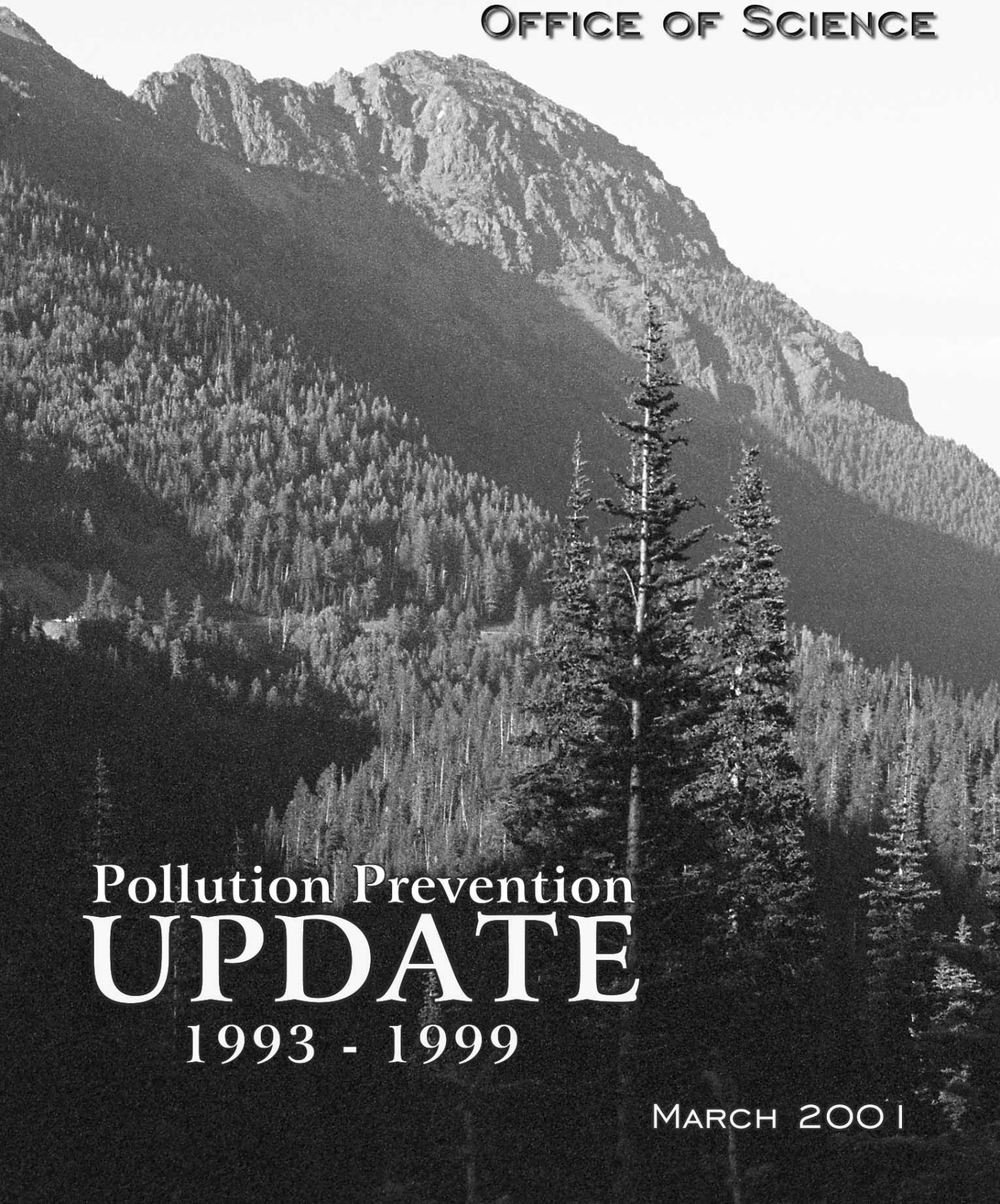
Office of Laboratory Operations & Environment, Safety & Health (SC-80)

Office of Science



Pollution Prevention UPDATE

1993 - 1999

March 2001

For Additional Information

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This report and other pollution prevention prevention information may be obtained from *EPIC*, the DOE Pollution Prevention Clearinghouse on the web at:
http://epic.er.doe.gov/epic

Office of Science

Pollution Prevention Update 1993-1999

March 2001

Office of Laboratory Operations and Environment, Health, and Safety (SC-80)

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LIST OF ACRONYMS USED

ANL-E ..... **Argonne National Laboratory-East**
APRS ..... **Affirmative Procurement Reporting System**
BNL ..... **Brookhaven National Laboratory**
Bonnv. ..... **Bonneville Power Administration**
DOE ..... **Department of Energy**
EM ..... **Environmental Management**
EO ..... **Executive Order**
EPA ..... **U.S. Environmental Protection Agency**
ES&H ..... **Environment, Safety, and Health**
ESH&I ..... **Environment, Safety, Health, and Infrastructure**
ETTP ..... **East Tennessee Technology Park**
FY ..... **Fiscal Year**
GSA ..... **General Services Administration**
HLW ..... **High-Level Waste**
INEEL ..... **Idaho National Engineering and Environmental Laboratory**
LBNL ..... **Lawrence Berkeley National Laboratory**
LLRI ..... **Lovelace Respiratory Research Institute**
LLW ..... **Low-Level Waste**
MLLW ..... **Mixed Low-Level Waste**
MTRU ..... **Mixed Transuranic Waste**
OMB ..... **Office of Management and Budget**
ORNL ..... **Oak Ridge National Laboratory**
PNNL ..... **Pacific Northwest National Laboratory**
Ports. ..... **Portsmouth Site Office**
PSO ..... **Program Secretarial Office**
RCRA ..... **Resource Conservation and Recovery Act**
SC ..... **Office of Science**
SLAC ..... **Stanford Linear Accelerator Facility**
SRS ..... **Savannah River Site**
TJNAF ..... **Thomas Jefferson National Accelerator Facility**
TRI ..... **Toxics Release Inventory**
TRU ..... **Transuranic Waste**
TSCA ..... **Toxic Substances Control Act**
WIPP ..... **Waste Isolation Pilot Project**
WVDP ..... **West Valley Demonstration Project**

1.0 Introduction

This document is the sixth in a series of updates on Office of Science (SC) pollution prevention activities. It provides the latest information available on waste generation and waste minimization activities, dollars spent purchasing designated goods containing recycled materials, and toxic release reductions. This update contains the following information:

- Waste Generation Trends from 1993 through 1999
- Affirmative Procurement Accomplishments in 1999
- Toxic Release Inventory Trends from 1993 through 1999
- Pollution Prevention Funding from the Environment, Safety, Health and Infrastructure (ESH&I) Five-Year Plan for FY 2000 through FY 2005
- 1999 Pollution Prevention and Waste Minimization Accomplishments (See Appendix A)

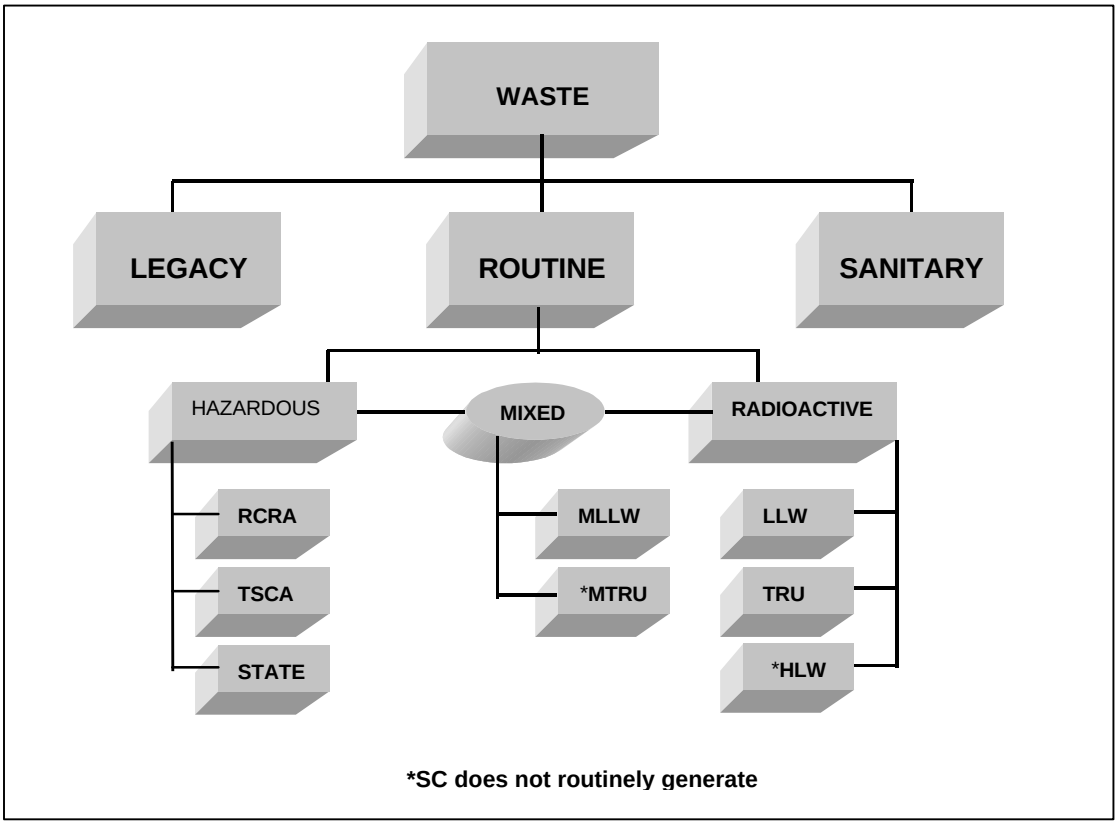
2.0 Waste Generation

This update is based on waste generation data from the latest Department of Energy (DOE) Environmental Management (EM) Annual Report of Waste Generation and Pollution Prevention Progress of September 2000. Since 1993, this series of annual reports has distinguished wastes generated by environmental restoration/clean-up activities (i.e., "legacy" wastes) from wastes generated by operations (i.e., routine or "newly generated" wastes). The scope of this document is limited to SC's routine wastes, which are generated from operations, and are not associated with "legacy wastes." In the future, wastes from deactivation and decommissioning (D&D) of facilities by SC will be considered routine wastes. The SC Pollution Prevention Update for the year 2000 will include waste generation data from the D&D of Princeton Plasma Physics Laboratory's Tokamak Fusion Test Reactor (TFTR).

The EM Annual Report list the quantities of wastes generated which are regulated under the Resource Conservation and Recovery Act (RCRA), the Toxic Substances Control Act (TSCA) and various state regulations. The sum of these three types of waste is reported collectively as Total Hazardous Wastes. The EM Annual Reports also list quantities of low-level radioactive waste (LLW), high-level wastes (HLW), transuranic wastes (TRU), mixed low-level wastes (MLLW) and mixed transuranic wastes (MTRU). SC does not routinely generate high-level or MTRU wastes, so for the purposes of this update, Total Radioactive Wastes are the sum of LLW, MLLW and TRU. Sanitary wastes are included in the EM Annual Reports. This update provides a summary of routine sanitary waste generation at SC laboratories. Figure 1 (Page 2) presents the types of wastes generated by SC and DOE Program Secretarial Offices (PSOs).

This report employs certain simplifying assumptions made in the EM Annual Reports. To enable quick comparison of quantities of radioactive wastes reported in cubic meters with quantities of hazardous wastes reported in metric tons, it is assumed that one cubic meter of waste equals one metric ton. This conversion factor is a gross approximation. An accurate conversion factor for radioactive waste depends on the physical state of the waste (liquid or solid), its composition, (lead, Styrofoam, etc.), and its degree of compaction, and

Figure 1 Types of Waste Generated



would have to be calculated for each wastestream. In addition, waste reporting methods vary among different laboratories. Some wastes reported as generated in a given year may have been generated previously, but were reported because they shipped for disposal during the year in question. SC will make efforts to avoid this problem in the future.

DOE sites reported their waste generation in the Annual Reports if quantities of any one type of waste exceeded any one of the following thresholds:

- 50 cubic meters of low-level waste
- 1 cubic meter of mixed waste
- 10 metric tons of RCRA-regulated waste
- 10 metric tons of TSCA-regulated waste

Data Qualifications

- ✓ Charts and graphs are based upon EM data used in the *EM Annual Report of Waste Generation and Pollution Prevention Progress, 1999.* Discrepancies between EM data and laboratory records are noted in the text of this update.
- ✓ In some instances, waste generated by other PSOs at SC labs may have been incorrectly attributed to SC. The exact number of these instances is not known.
- ✓ Toxic Release Inventory data are still undergoing validation by EPA.

2.1 DOE-Wide Pollution Prevention Goals

DOE tracks and reports the quantities of waste it generates, because it is committed to specific waste reduction goals. In 1996, the Secretary of Energy set the following pollution prevention goals to be achieved by December 31, 1999. Waste generation levels in 1993 are used as the baseline for comparison.

- Reduce generation of routine radioactive waste by 50 percent.
- Reduce generation of routine MLLW by 50 percent.
- Reduce the generation of routine hazardous waste by 50 percent.
- Reduce the generation of sanitary waste by 33 percent.

Other pollution prevention goals to be achieved by this date include:

- Recycle 33 percent of sanitary wastes.
- Increase procurement of EPA-designated recycled products to 100 percent.

On November 12, 1999, the Secretary of Energy renewed and expanded these goals. Using the same 1993 baseline, DOE has committed to the following reductions in routine waste generation by 2005:

- Reduce generation of routine hazardous waste by 90 percent.
- Reduce generation of low-level wastes by 80 percent.
- Reduce low level mixed wastes by 80 percent.
- Reduce transuranic wastes by 80 percent.
- Reduce of toxic chemical inventory (TRI) releases by 90 percent.
- Reduce sanitary wastes by 75 percent— then achieve an 80 percent reduction by 2010.

SC 1999 Pollution Prevention Highlights

Waste Type	*1999 Reduction*	*1999 Goal*	*2005 Goal*
Total Hazardous Wastes	-84%	-50%	-90%
State Wastes	-89%	-50%	-90%
RCRA Wastes	-69%	-50%	-90%
TSCA Wastes	-64%	-50%	-90%
Total Radioactive Wastes	-62%	-50%	-80%
Low Level Wastes	-61%	-50%	-80%
Mixed Low Level Wastes	-74%	-50%	-80%
Sanitary Wastes	-43%	-33%	-75%

The Secretary of Energy set additional pollution prevention goals:

- Recycle 45 percent of sanitary wastes by 2005 and 50 percent by 2010.
- Increase purchases of EPA-designated items with recycled content to 100 percent by 2005, except when not available at competitive price or when they do not meet performance standards.

The pollution prevention goals apply to DOE as a whole, not to PSOs or individual generators. However, measuring SC waste reduction against these goals is a useful measure of commitment to the Department's goals. In February 2001, SC sites developed site-specific goals to support the DOE-wide goals.

2.2 SC Reporting Sites

Eleven sites under SC management reported waste generation from 1993 to 1999. Another six sites with SC activities reported waste generation during this period. Totals for SC waste generation are the sums of SC wastes generated at all 17 of these sites. Table 1 lists the sites included in this update.

Table 1: List of Sites Included in this Update	
Sites under SC Management	
Accelerator Facilities:	Fermi National Accelerator Facility (Fermi) Stanford Linear Accelerator Facility (SLAC) Thomas Jefferson National Accelerator Facility (TJNAF)
Multi-program Sites:	Argonne National Laboratory-East (ANL-E)* Brookhaven National Laboratory (BNL) Lawrence Berkeley National Laboratory (LBNL) Oak Ridge National Laboratory (ORNL) Pacific Northwest National Laboratory (PNNL)
Small Laboratories:	Ames Laboratory (Ames) Princeton Plasma Physics Laboratory (PPPL)
Other DOE Sites with SC Activities	
Lawrence Livermore National Laboratory (LLNL) Los Alamos National Laboratory (LANL) Lovelace Respiratory Research Institute (LRRI) (1993 to 1997 only) Oak Ridge Institute for Science and Education (ORISE) Office of Science and Technical Information (OSTI) Sandia National Laboratory-California (SNL-CA) Sandia National Laboratory-New Mexico (SNL-NM)	

2.3 Summary of Annual Report Data

Figure 2 presents the sum of SC's total routine waste generation (hazardous and radioactive wastes) from 1993 to 1999. Table 2 (Page 6) shows the types of quantities of routine wastes that SC generated during this period. Figure 3 shows that these routine wastes make up a relatively small portion of the total wastestream at SC laboratories.

Figure 2

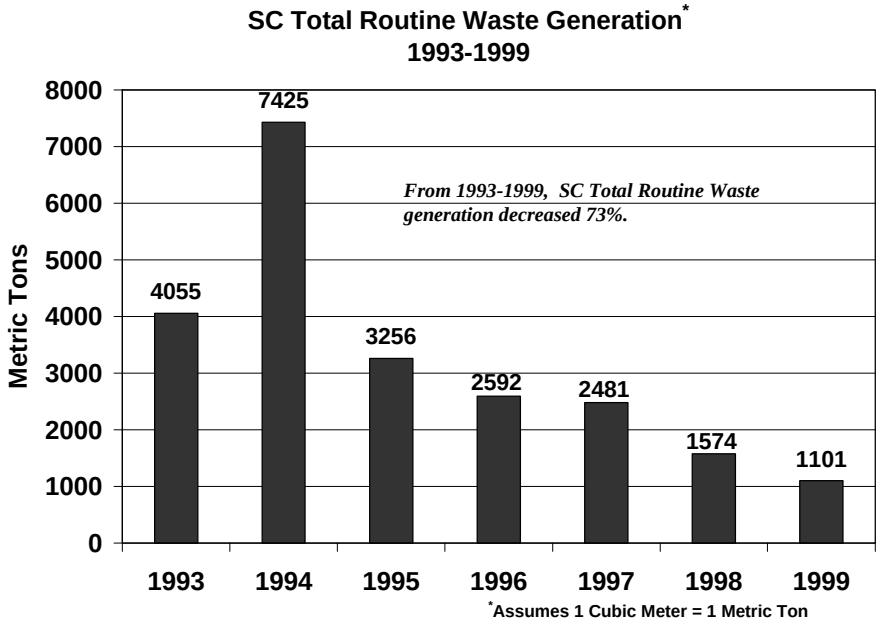


Figure 3

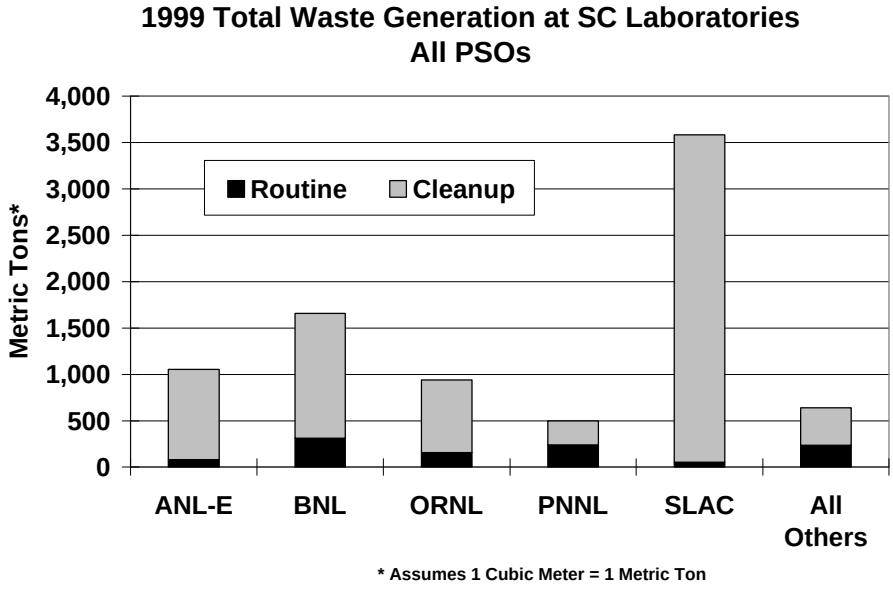


Table 2: SC Routine Waste Generation, 1993-1999

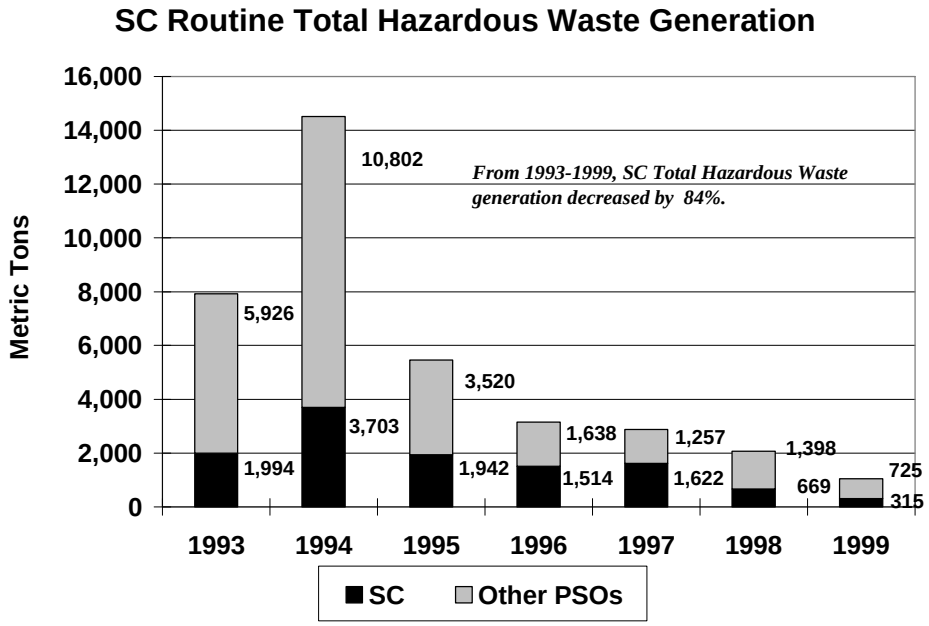
	Hazardous Wastes (Metric Tons)				Radioactive Wastes (Cubic Meters)			
	RCRA	*State*	*TSCA*	*Total Hazardous*	*LLW*	*MLLW*	*TRU*	*Total Radioactive*
1993	437	1,535	22	1,994	1,947	114*	0	2,061
1994	248	2,596	859	3,703	3,626	96	0	3,722
1995	229	1,463	250	1,942	1,263	51	0	1,314
1996	201	1,295	18	1,514	1,053	25	0	1,078
1997	171	1,446	5	1,622	819	40	0	859
1998	243	423	3	669	868	33	4	905
1999	135	172	8	315	762	23	1	786

* Revised downward to 89.02 cubic meters upon review of records at LBNL. Section 2.5.2 of this report cites the uninflated figure.

2.4 Hazardous Waste Generation

Routine hazardous wastes consist of RCRA, TSCA, and state-regulated wastes. Trends for routine hazardous waste generation are presented in Figure 4. In 1999, SC Total Hazardous Waste generation was 84 percent lower than the 1993 baseline. A dramatic drop in generation of state-regulated wastes at ANL-E in 1998 is the primary cause of this decline. As seen in Table 2 (Page 6), state-regulated wastes continue to be the largest component of SC hazardous wastes. (See Section 2.4.1.) In 1999, SC generated 30 percent of the DOE routine hazardous waste stream, down from 56 percent in 1997 .

Figure 4



2.4.1 State-Regulated Wastes

State-regulated wastes are hazardous wastes which are not regulated under RCRA, but which are listed as hazardous and are subject to regulation by states or other local authorities. The Environmental Protection Agency does not necessarily consider them hazardous. Figure 5 (Page 8) shows SC's generation of routine state-regulated wastes for the given period. Most of the decline in SC's state-regulated waste generation took place between 1997 and 1998. State-regulated wastes have made up nearly 90 percent of SC 's hazardous wastes before 1998. Trends for generation of state-regulated wastes at individual laboratories are presented in Figure 6 (Page 8).

Figure 5

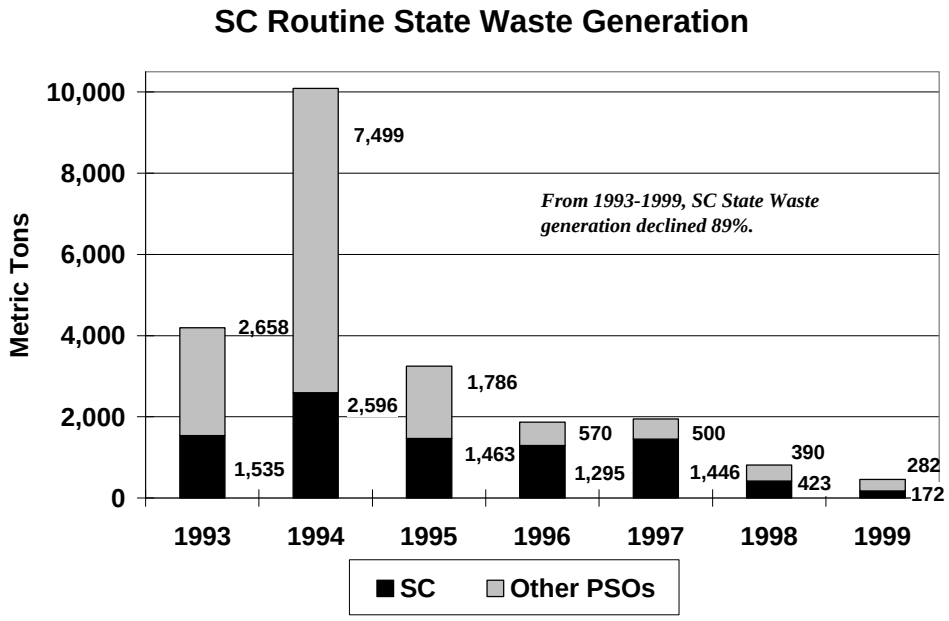
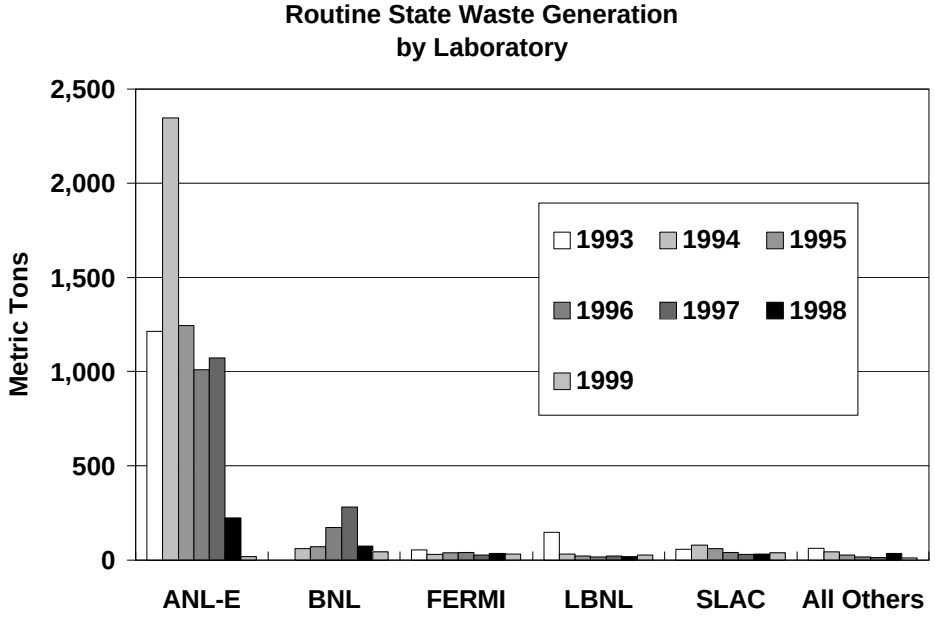


Figure 6



Percent Change in SC State Waste Generation from 1993-1999					
ANL-E	**BNL**	**Fermi**	**LBNL**	**SLAC**	**All Others**
-99%	**N/A**	**-41%**	**-81%**	**-33%**	**-83%**

Table 3 shows the states that regulate non-RCRA hazardous wastes at SC sites. Prior to 1998, ANL-E was subject to Illinois waste regulations, which classified coal fines from the central steam plant as state-regulated wastes. These regulations made ANL-E the single largest generator of state-regulated wastes in SC, and made SC the single largest generator of state wastes in DOE. In 1998, Illinois regulations stopped classifying coal fines as state-regulated wastes, allowing ANL-E to dispose of its coal fines as ordinary municipal waste. ANL-E's aggressive measures to recycle its coal fines have kept these former state-regulated wastes out of the sanitary wastestream.

Table 3: State-Regulated Hazardous Wastes at SC Facilities (Metric Tons)

State	Labs	1993	1994	1995	1996	1997	1998	1999
CA	LBNL, LLNL, Sandia/CA, SLAC	232	138	91	64	54	53	71
IL	ANL-E, Fermi	1,268	2,377	1,282	1,048	1,099	260	50
NY	BNL	N/A	60	70	171	281	75	44
Others:* (IA, NJ, NM, TN, VA, WA)	Ames, LRRI, PNNL, PPPL, Sandia/NM, TJNAF	35	21	20	12	12	35	7
	Totals:	**1,535**	**2,596**	**1,463**	**1,295**	**1,446**	**423**	**172**

*The State of Tennessee (ORISE, ORNL) does not add its own regulations to Federal hazardous waste regulations.

2.4.2 RCRA Wastes

RCRA wastes are solid wastes that are either listed hazardous wastes or wastes, which exhibit the characteristics of a hazardous waste according to 40 CFR 261. Figure 7 (Page 10) presents SC routine RCRA waste generation from 1993 to 1999. Total SC quantities declined by 69 percent relative to the 1993 baseline. SC's relative contribution to the DOE RCRA waste stream has been steadily rising as total DOE quantities decline. SC contributed 7 percent of DOE's routine RCRA wastes in 1994, 20 percent in 1997, and more than 25 percent in 1998 and 1999.

Figure 7

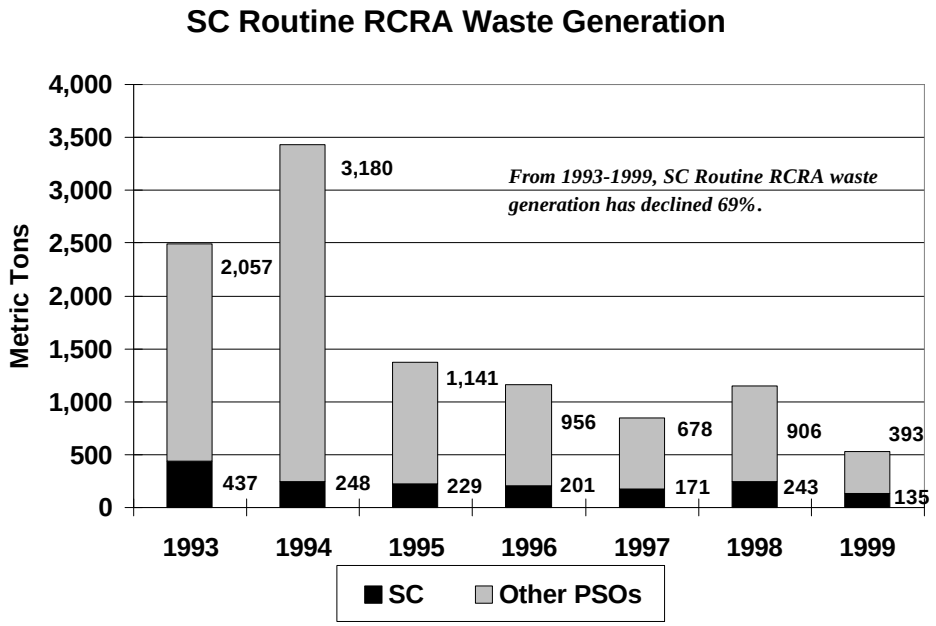
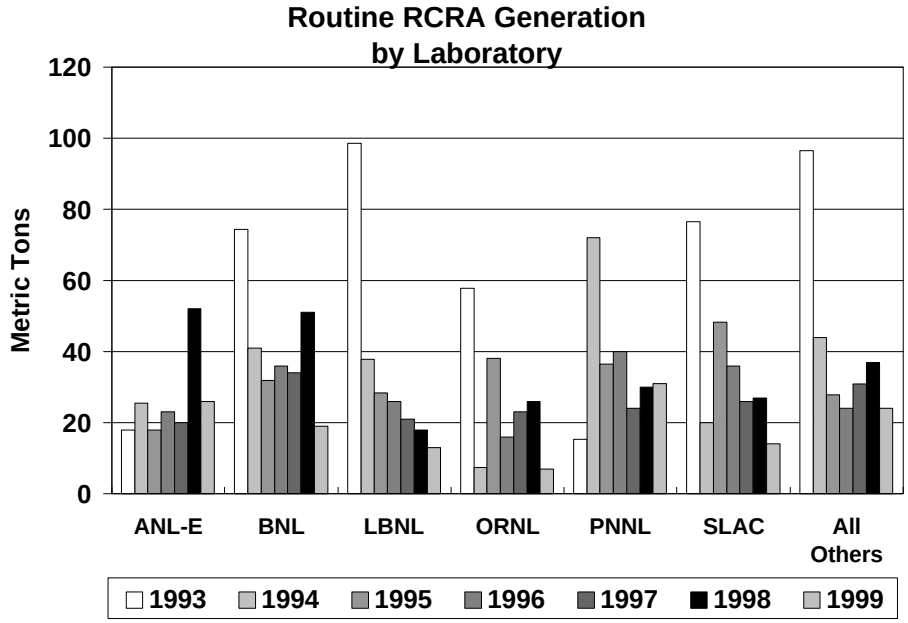


Figure 8 (Page 11) shows RCRA generation trends in SC laboratories. Six laboratories were responsible for more than 75 percent of SC's RCRA waste generation from 1993 to 1999: ANL-E, BNL, LBNL, ORNL, PNNL and SLAC. Since 1993, RCRA waste generation has decreased by 75 percent or more at BNL, LBNL, ORNL, and SLAC.

Percent Change in SC RCRA Waste Generation from 1993-1999						
ANL-E	**BNL**	**LBNL**	**ORNL**	**PNNL**	**SLAC**	**All Others**
-5%[1]	**-75%**	**-86%**	**-73%**	**-57%[2]**	**-82%**	**-75%**

1. EM data indicate that ANL-E generated 17.93 metric tons of waste in the 1993 baseline year. ANL-E's records show generation of 27.4 metric tons of waste in 1993. The percent reduction is calculated based on ANL-E's records.
2. A state shipping moratorium was in place at PNNL during 1993, so 1994 data was used as the baseline to calculate the percent reduction.

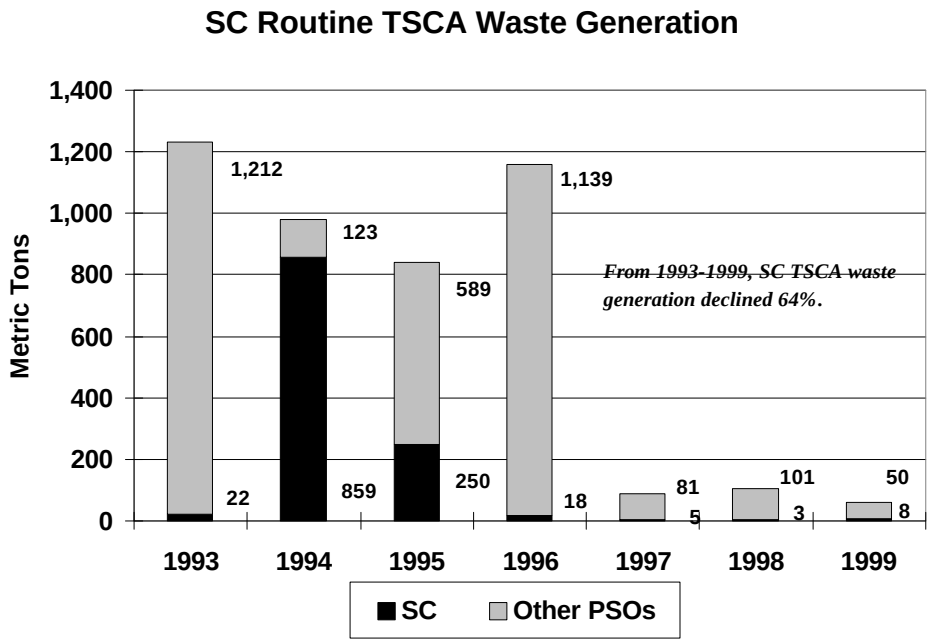
Figure 8



2.4.3 TSCA Wastes

TSCA wastes are individual wastes, such as asbestos or polychlorinated biphenyls (PCBs), that fall under the regulation of the Toxic Substances Control Act (TSCA). The majority of TSCA wastes are not generated by operations, but result from the disposal of equipment, such as transformers, or from the demolition of buildings containing asbestos. These disposal activities are not part of the legacy clean-up, so the resultant TSCA wastes are considered routine. Figure 9 (Page 12) presents SC's generation of TSCA wastes. SC's generation of routine TSCA wastes peaked in 1994, and constituted 87 percent of the DOE total. This peak may be attributable to one-time disposal activities at ongoing SC operations. In subsequent years, routine TSCA waste generation has decreased. SC generates occasional peaks of TSCA wastes from renovations and building demolitions. In 1999, Ames, Fermi, ORISE, and PNNL all generated small quantities (one to three metric tons) of TSCA waste.

Figure 9



2.5 Total Radioactive Waste Generation

Total radioactive wastes in SC are the combined quantities of LLW, MLLW and TRU. As seen in Figure 10 (Page 13), total radioactive wastes have declined by 62 percent in comparison to the 1993 baseline. Since 1993, SC has consistently contributed between five and seven percent of the total DOE wastestream for these two types of wastes. The majority of this contribution is in LLW; SC contributed seven percent of the DOE's LLW in 1999.

Percent Change in SC Total Radioactive Waste Generation from 1993-1999					
ANL-E	**BNL**	**Fermi**	**ORNL**	**PNNL**	**All Others**
-64%	**-28%**	**-39%**	**-70%**	**-74%**	**-58%**

Figure 10

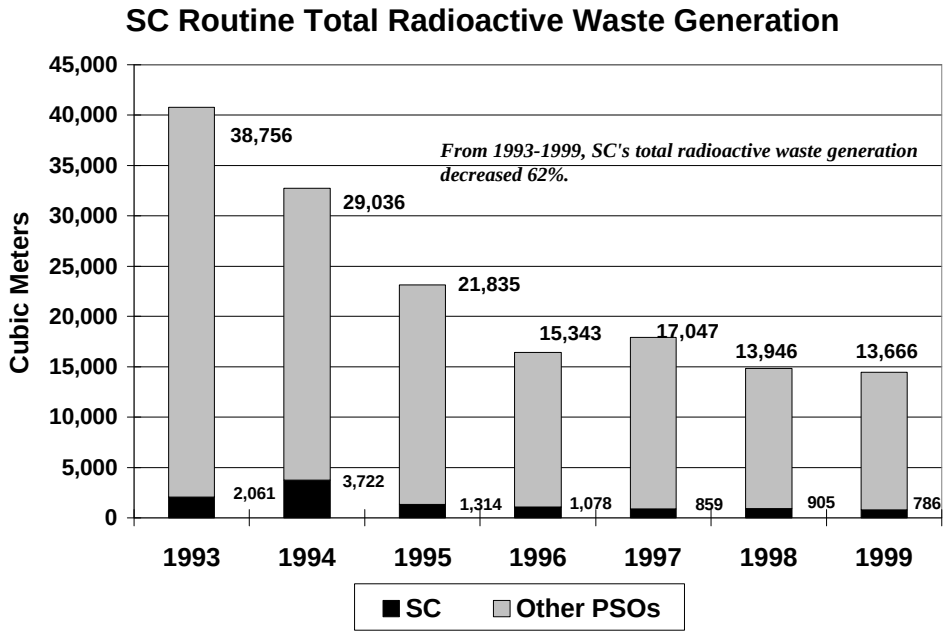
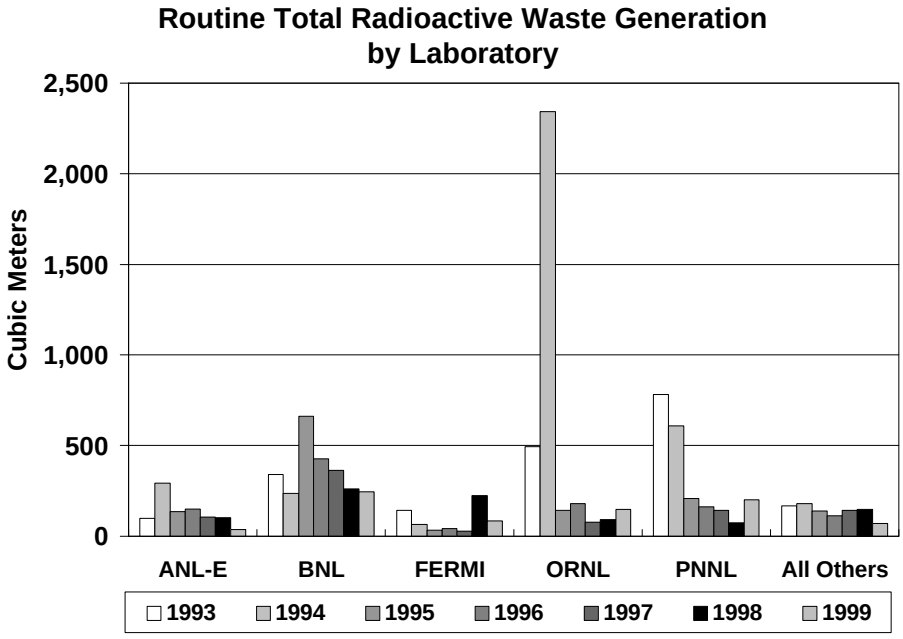


Figure 11 shows total radioactive waste generation trends in SC laboratories. In 1999, BNL and PNNL generated about 60 percent of all of SC's radioactive wastes, and about 4 percent of the DOE total.

Figure 11



2.5.1 Low-Level Wastes (LLW)

Low-level wastes are radioactive wastes that are not classified as high-level waste, transuranic waste, spent nuclear fuel, or byproduct material. Figure 12 shows SC's generation of LLW from 1993 to 1999. SC's LLW generation has declined 61 percent from 1993 levels. Figure 13 (Page 15) shows LLW generation by laboratory. Four laboratories contributed about 75 percent of SC's LLW over this three-year period: ANL-E, BNL, ORNL, and PNNL. BNL has been SC's largest generator from 1995 to 1999, contributing more than 30 percent of the SC total. After peaking last year in preparation for the commissioning of the new Fermilab Main Injector (FMI), Fermi's generation of LLW fell to 62 percent of the 1993 baseline.

Figure 12

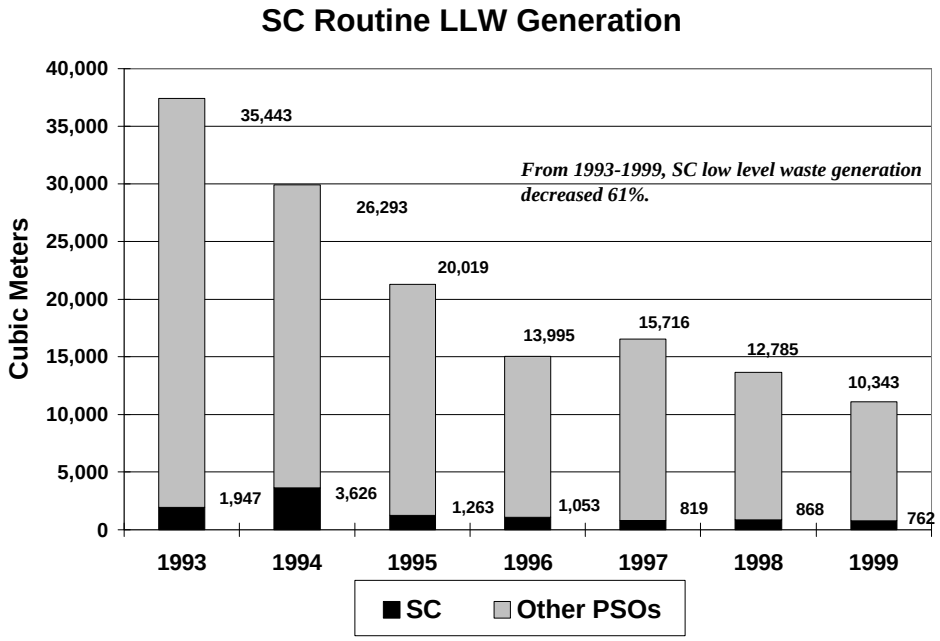


Figure 13

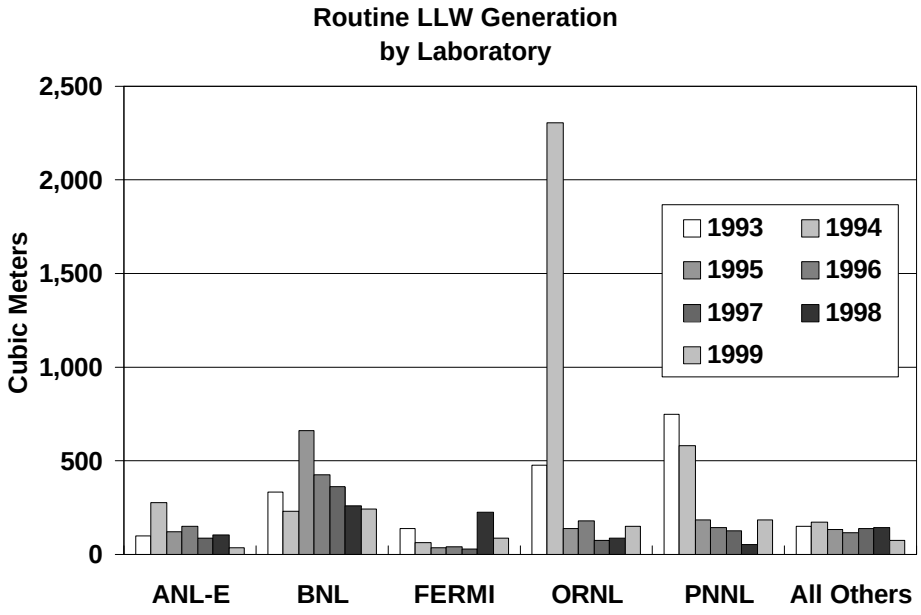


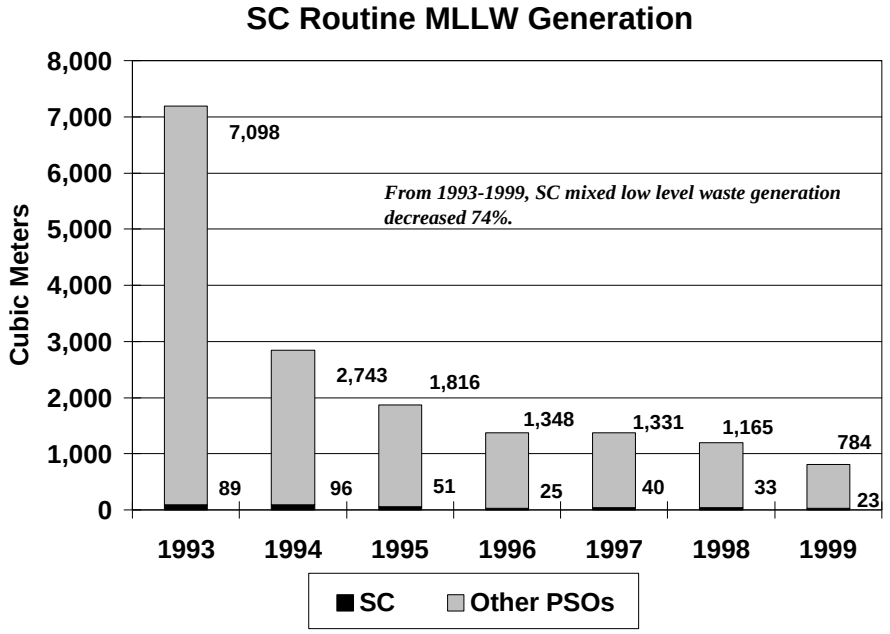
Figure 13 is based on official DOE figures, which report 2306 cubic meters of LLW at ORNL in 1994. ORNL's records report generation of 126 cubic meters of LLW in 1994.

Percent Change in SC LLW Generation from 1993-1999					
ANL-E	**BNL**	**Fermi**	**ORNL**	**PNNL**	**All Others**
-63%	**-15%**	**-38%**	**-57%**	**-75%**	**-52%**

2.5.2 Mixed Low-Level Wastes (MLLW)

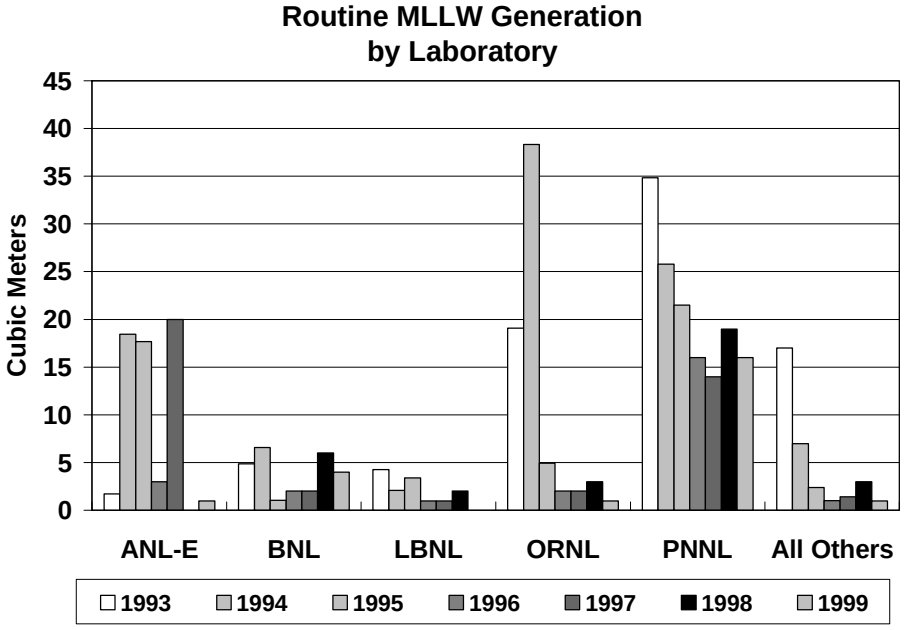
Mixed low-level wastes are low-level wastes that contain a RCRA waste component. SC has never generated large quantities of MLLW. Figure 14 (Page 16) presents SC's MLLW generation. SC's greatest volume of MLLW, 96 cubic meters, was generated in 1994 at 13 laboratories. In 1999, SC operations generated MLLW at five laboratories: ANL-E, BNL, LLNL, ORNL and PNNL. In 1993, LBNL originally reported generation of 36 cubic meters of MLLW. A subsequent review of records showed that SC only generated 4.28 cubic meters of MLLW in 1993, which is the quantity cited in this report. Figure 15 (Page 16) summarizes SC MLLW generation by laboratory.

Figure 14



Percent Change in SC MLLW Generation from 1993-1999						
ANL-E	**BNL**	**LBNL**	**LLNL**	**ORNL**	**PNNL**	**All Others**
-42%	**-18%**	**-100%**	**-90%**	**-95%**	**-54%**	**-100%**

Figure 15



2.5.3 Transuranic Wastes (TRU)

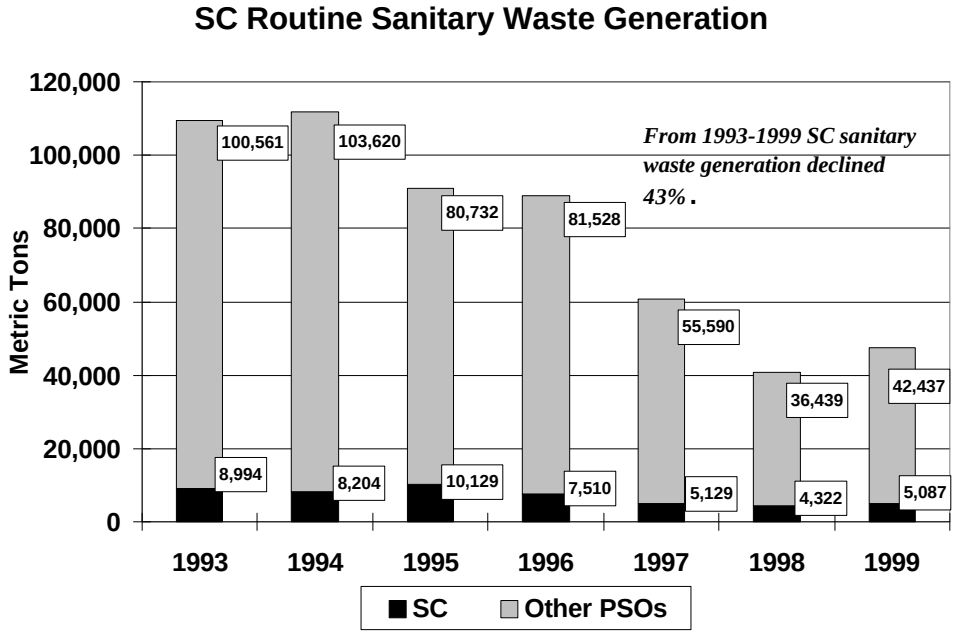
Transuranic wastes contain more than 100 nanocuries per gram of an alpha-emitting radionuclide that is heavier than uranium (atomic number 92). From 1993 to 1998, SC operations at the ORNL High Flux Isotope Reactor sporadically generated small quantities of TRU waste. ORNL had a peak of 24 cubic meters in 1994; generation in all other years was less than one cubic meter. In 1999, PNNL research generated 1 cubic meter of TRU waste in support of the cleanup of the Hanford Complex. At present only wastes generated by defense activities may be sent to the Waste Isolation Pilot Project (WIPP) for disposal; there is no disposition path for non-defense TRU wastes. SC projects that generate non-defense TRU wastes must receive advance approval from the SC sponsoring program before commencement of work.

2.6 Sanitary Waste Generation and Recycling

2.6.1 Sanitary Waste Generation

Sanitary wastes are wastes generated by normal housekeeping that are not hazardous or radioactive (i.e., garbage). Figure 16 compares sanitary waste generation at SC sites to the rest of DOE from 1993 to 1999. (DOE stopped reporting sanitary waste by PSO in 1997; sanitary wastes were assigned to the site's landlord beginning in 1998. SC routine sanitary waste generation decreased 43 percent in 1999 compared to the 1993 baseline. Figure 17 (Page 18) shows sanitary waste generation trends from all PSOs at individual laboratories. The sanitary waste data presented in Figure 16 were reported from laboratories as an entity; data are not available for SC's share of the sanitary waste generation at the laboratory level. Laboratory-level data were unavailable for Ames and ORISE. Furthermore, the sanitary waste summary data do not capture sanitary waste management practices at individual laboratories. For example, a significant portion of PNNL's sanitary waste, such as that generated at leased facilities is not tracked by weight and is not

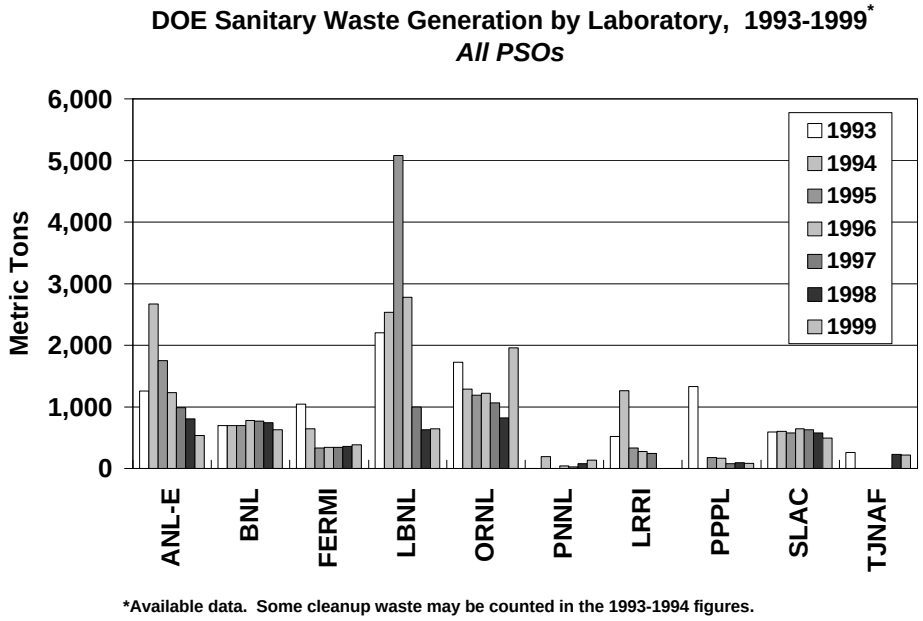
Figure 16



included in these figures. The increase in sanitary waste generation at LBNL in 1995 arose from vegetation removal as part of a one-time fire protection program.

SC's sanitary waste generation increased 18 percent from 1998 to 1999. Most of this increase came from ORNL, whose sanitary waste generation increased by more than 1,000 metric tons in the last year as the result of an unusually large number of laboratory and office moves. An improved waste tracking system also increased the figure for sanitary waste generation by including ORNL projects at the Y-12 site.

Figure 17



Percent Change in SC Sanitary Waste Generation from 1993-1999								
ANL-E	**BNL**	**FERMI**	**LBNL**	**ORNL**	**PNNL**	**PPPL**	**SLAC**	**TJNAF**
-57%	**-9%**	**-63%**	**-71%**	**+13%**	**NA**	**-94%**	**-16%**	**-15%**

2.6.2 Recycling

The large decreases in sanitary waste generation may be attributable to successful recycling programs at SC laboratories. Figure 18 shows that the quantity of recycled materials (paper, scrap metals, precious metals, and other products) is more than two times the quantity of sanitary wastes generated in 1999. This trend is present at most SC laboratories, as seen in Figure 19.

Figure 18

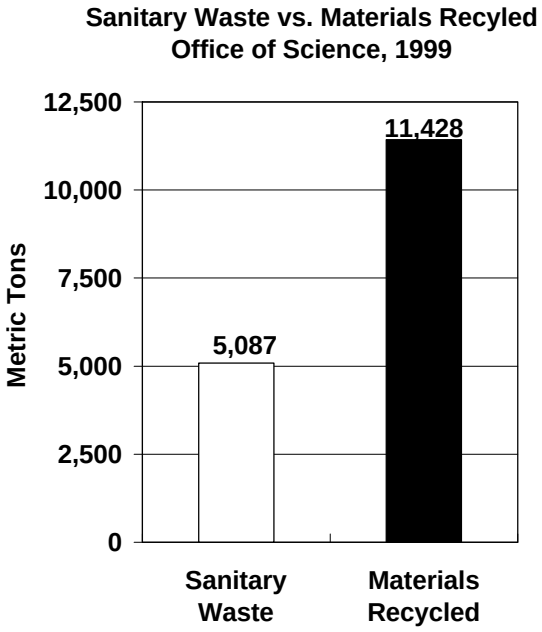
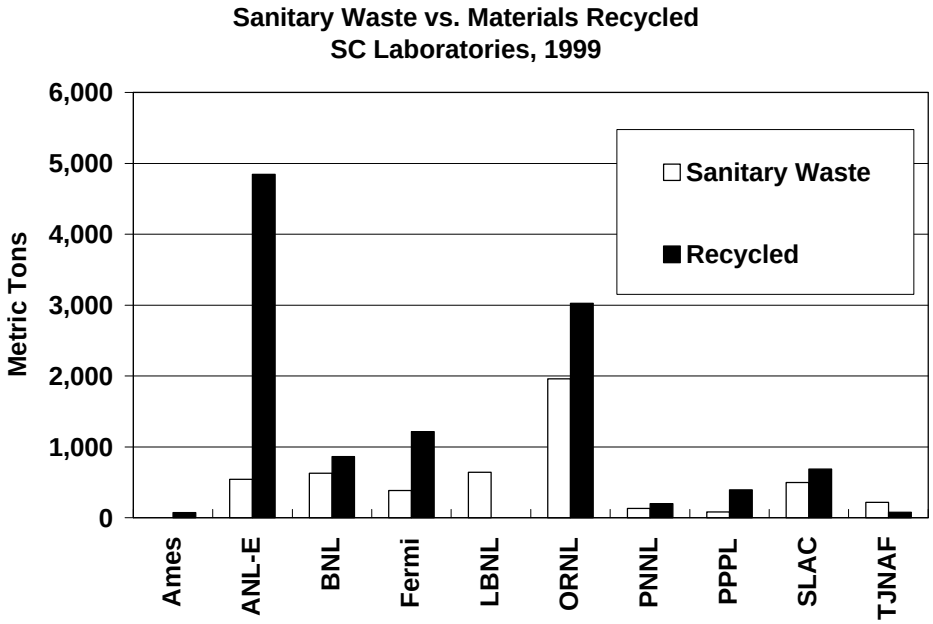


Figure 19



2.7 Trends in SC Waste Generation

2.7.1 Relative Contribution of SC Sites

Waste generation data show that each SC laboratory continues to significantly reduce its hazardous and radioactive wastestreams. An overview of site-specific pollution prevention accomplishments is presented in Appendix A of this update.

Table 4 ranks SC waste generation at DOE sites. Table 5 (Page 21) shows the top ten sites generating routine wastes for all PSOs in DOE (e.g., DP, EM, NE, etc.) and shows that SC's relative ranking among waste generators is declining as waste generation declines. ORNL has been among the top ten for the reporting period. Table 6 (Page 22) ranks SC waste generation in 1999 by waste type. In 1999, SC operations at all laboratories generated only seven percent of DOE's routine wastes, down from approximately twelve percent from 1995 to 1997.

Figure 20 (Page 22) shows that two laboratories, BNL and PNNL generated about half of all of SC's routine hazardous and radioactive wastes in 1999. ANL-E used to generate 20 percent of DOE's routine hazardous wastes. ANL-E is no longer one of DOE's top waste generators, and is only the fifth largest generator in SC. In 1999, waste generation at ANL-E continued to decline dramatically, because the State of Illinois stopped classifying coal fines as state-regulated wastes. It is also possible that more accurate waste reporting at ANL-E prevented wastes from other PSOs from being incorrectly attributed to SC.

Table 4: Ranking of SC Waste Generation by DOE Lab, 1999 Hazardous and Radioactive Wastes

Rank	Lab	Totals Metric Tons
1	BNL	310
2	PNNL	240
3	ORNL	156
4	FERMI	124
5	ANL-E	80
6	LBNL	54
7	SLAC	52
8	PPPL	37
9	LLNL*	15
10	LANL*	8
11	TJNAF	8
12	AMES	7
13	ORISE	5
14	SNL-CA*	4
15	SNL-NM*	1
	SC TOTAL:	1,101

* SC totals at NNSA sites.

Table 5: Top Ten Generators of DOE Routine Wastes, 1993-1999
Includes Waste Generation for All PSOs
Metric Tons*

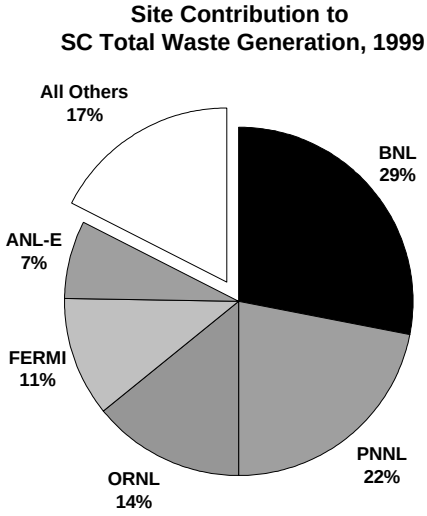
Rank	1993		1994		1995	
1	SRS	14,739	SRS	9,568	SRS	10,895
2	Y-12	3,995	Hanford	4,981	Hanford	3,063
3	Hanford	3,919	INEEL	4,908	INEEL	2,187
4	LANL	3,004	NTS	4,441	K-25	2,151
5	Ports.	2,251	ORNL	3,433	**ANL-E**	2,027
6	Fernald	2,181	**ANL-E**	2,876	Bonnv.	1,340
7	Mound	1,874	Mound	2,841	LANL	1,287
8	**ORNL**	1,781	Y-12	2,308	**ORNL**	995
9	Pantex	1,779	LANL	2,134	Rocky F.	964
10	WVDP	1,450	Bonnv.	2,016	Mound	767
Rank	1996		1997		1998	
1	SRS	8,833	SRS	9,072	SRS	9,461
2	INEEL	2,186	INEEL	2,311	Y-12	2,446
3	**ANL-E**	1,528	Y-12	1,978	INEEL	1,324
4	Hanford	1,528	Fernald	1,708	LANL	939
5	Fernald	1,059	**ANL-E**	1,453	Hanford	711
6	Y-12	1,029	Hanford	972	LLNL	550
7	**ORNL**	939	**BNL**	804	**ANL-E**	378
8	Mound	766	**ORNL**	691	Fernald	528
9	Rocky F.	726	Mound	591	**BNL**	390
10	LANL	708	LANL	507	**ORNL**	324

Rank	1999	
1	SRS	7,816
2	INEEL	1,563
3	Y-12	1,491
4	LANL	878
5	Hanford	474
6	LLNL	374
7	WVDP	336
8	**BNL**	310
9	**ORNL**	302
10	Fernald	285

Table 6: Generators of SC Routine Wastes in 1999
Ranked by Waste Type
Rounded to Nearest Unit

Rank	Radioactive Wastes **(Cubic Meters)**						Hazardous Wastes **(Metric Tons)**					
	LLW		*MLLW*		*TRU*		*State*		*RCRA*		*TSCA*	
1	BNL	241	PNNL	16	PNNL	1	BNL	44	PNNL	31	BNL	2
2	PNNL	184	BNL	4			SLAC	38	ANL-E	26	TJNAF	1
3	ONRL	148	ANL-E	1			FERMI	32	BNL	19		
4	FERMI	86	LLNL	1			LBNL	28	SLAC	14		
5	ANL-E	35	ORNL	1			ANL-E	18	LBNL	13		
6	PPPL	34					PNNL	5	ORNL	7		
7	LBNL	13					LLNL	3	FERMI	5		
8	LANL	8					SNL-CA	2	LLNL	5		
9	LLNL	6					PPPL	1	TJNAF	5		
10	ORISE	4							AMES	3		
11	TJNAF	3							SNL-CA	3		
12	AMES	2							PPPL	2		
13									SNL-NM	1		

Figure 20



2.8 Waste Generation Per Operating Dollar

Figure 21 shows SC Operating Expense (OE) funding from 1995 to 1999. A a ratio of waste output (grams) to inputs (operating dollars used for labor and supplies was developed to measure waste generation against the level of activity in SC. Figure 22 shows the grams of waste generated per operating dollar in SC. Since 1995, SC has decreased its baseline generation of all types of routine waste as activity levels remained constant. This decrease is a sign of successful waste avoidance from increased recycling, pollution prevention measures in existing projects, and from new research activities that generate less waste by design.

Figure 21

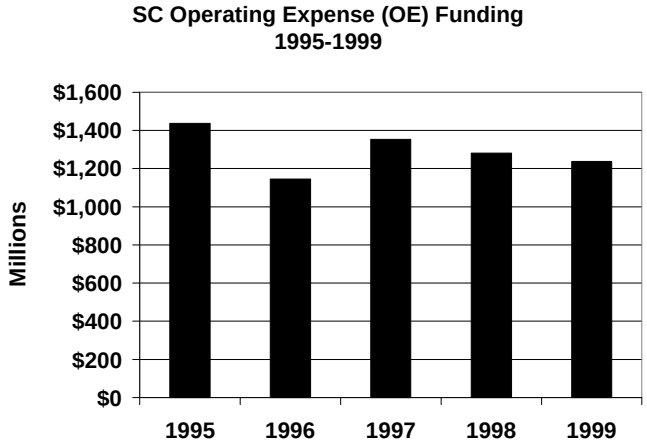
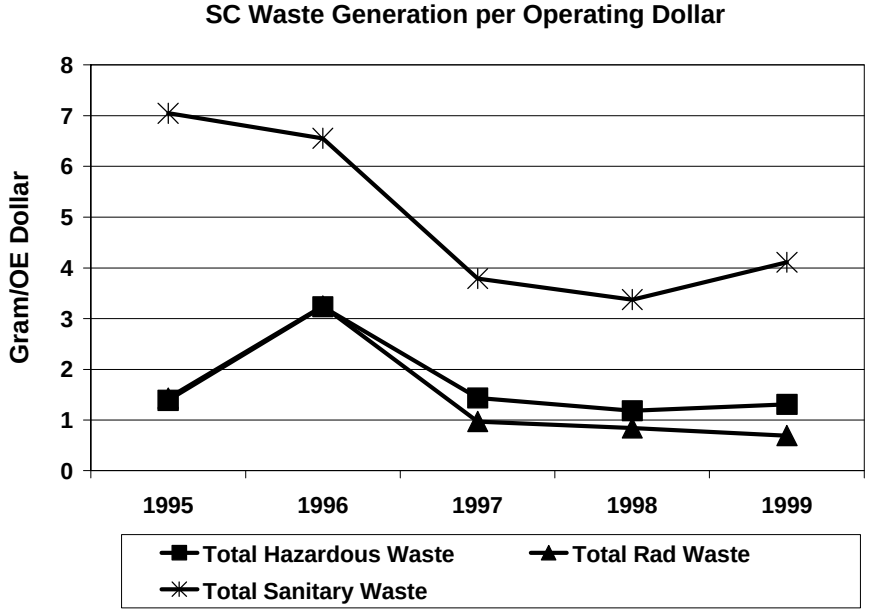


Figure 22



2.9 Waste Generated by Other PSOs

SC activities are not the only ones generating routine wastes at SC laboratories. Figure 23 shows that SC generated 86% percent of the newly generated (i.e., routine) wastes at its laboratories, with Environmental Management (EM) being the next largest generator. Non-SC PSOs generated significant amounts of routine wastes at three multi-program laboratories: ANL-E, LBNL, and ORNL. Figures 24-26 (Pages 24-25) show the waste generation by PSO at these laboratories. The other two multiprogram laboratories, BNL and PNNL, reported no routine waste generation from organizations other than SC.

Figure 23

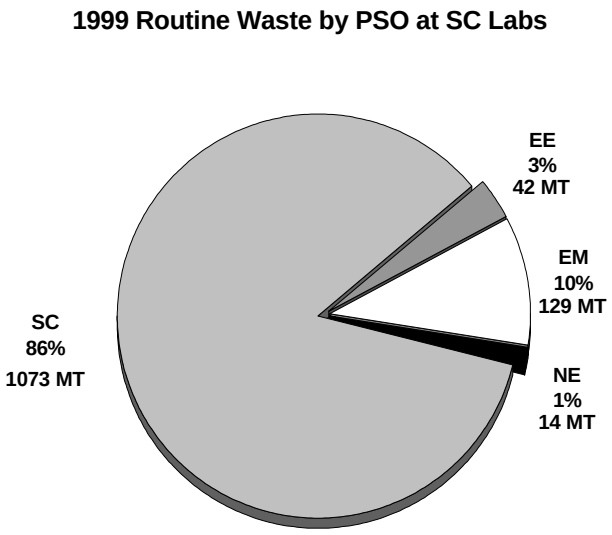


Figure 24

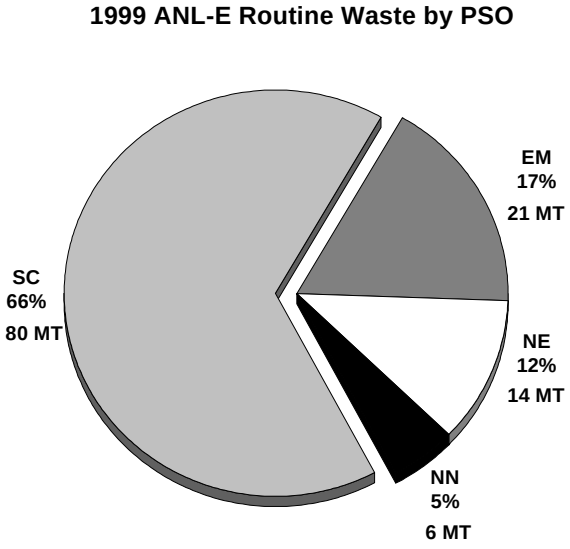


Figure 25

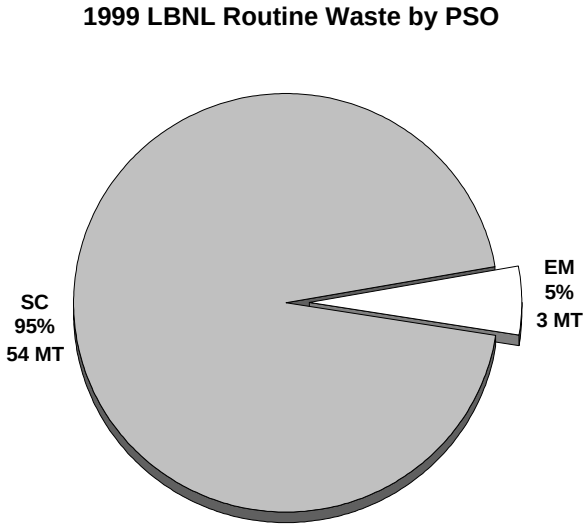
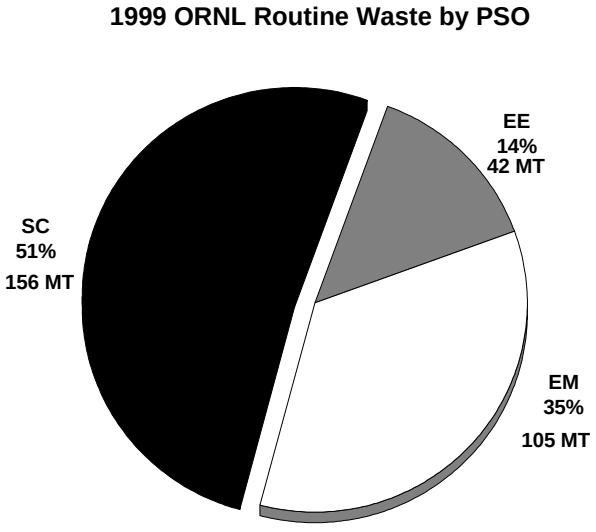


Figure 26



3.0 Waste Management Funding at SC Laboratories

In fiscal year 2001, SC assumed responsibility for all costs for management of all newly generated wastes at its sites. EM will continue to cover the costs of managing "legacy" wastes. SC landlord program at an individual site will provide funding for waste management. Table 7 shows waste management funding at SC laboratories in FY 2001. These funds will be used to cover all routine wastes (i.e., newly-generated wastes) from all generators at all sites.

Table 7: SC Waste Management Funding FY 2001

Ames	$267,000
ANL-E	$7,806,000
BNL	$5,957,000
Fermi	$2,210,000
LBNL	$5,500,000
PNNL	$1,200,000
PPPL	$3,157,000
SLAC	$2,700,000

4.0 SC Affirmative Procurement

Affirmative Procurement is the acquisition of products that have been manufactured completely or partially from recycled materials. Executive Order (EO) 13101, *Greening the Government*, requires that each federal agency establish an Affirmative Procurement Program. Initially, the program required the purchase of just five products: re-refined lubricating oil, retreaded tires, insulation containing recovered materials, and concrete and cement containing fly-ash or furnace slag. By 1997, over 20 products with recycled content were required to be purchased. The EO requires government agencies to achieve 100 percent acquisition of the listed recycled products, and directs the U.S. Environmental Protection Agency (EPA) to expand the list by continuously designating products with recycled content as they become available on the market at a reasonable price. The final rule of the Department of Energy Acquisition Regulations (DEAR) of October 13, 1995 requires the acquisition and use of environmentally preferable products and services by DOE and its management and operations (M&O) contractors. In 1996, the Secretary of Energy set the DOE-wide goal of 100 percent affirmative procurement of listed recycled products by December 1999. In November 1999, the Secretary of Energy reaffirmed the Department's commitment to 100 percent procurement of recycled goods by 2005.

4.1 Affirmative Procurement Evaluation

The EM Office of Pollution Prevention supplied the data on SC's affirmative procurement from the DOE Affirmative Procurement Reporting System (APRS). In accordance with OMB requirements, the system reports total dollar amounts of the EPA-designated items and the dollar amounts expended on the same items that have recycled content. Paper products purchased under GSA auspices and airplane tires are not included. It is not possible to determine the quantities of the EPA-designated items from the dollar figures. The APRS reports on total dollars spent without adjusting for inflation. Relative costs of the recycled items vary widely; recycled tires are cheaper than the new counterparts, while recycled paper generally costs more than virgin paper. EO 13101 does not require acquisition of recycled products that are not cost-competitive or which do not meet technical specifications.

Data are reported from sites where SC is the landlord. It should be noted that all purchases were attributed to SC at these sites, even though other programs may be operating there.

4.2 Summary of Affirmative Procurement Results

Table 8 (Page 28) shows that SC achieved an 86 percent Affirmative Procurement rate in 1999, slightly exceeding the rate for DOE as a whole. Please note that the adjusted total purchases are presented here; the figures do not include products that were not available, did not meet technical specifications, or were not cost competitive. These exclusions are permitted in the Cost, Availability, or Performance (CAP) clause of the EO. Tables 9 through 12 (Pages 29-32) show Affirmative Procurement rates for specific product categories. These product categories include an expanded list of products. For example, vehicular products are reported instead of just tires or oil.

Table 8: 1999 Affirmative Procurement at SC Laboratories			
Lab	**All Products**		
	Total	Recycled	% Recycled
Ames	$49,395	$43,688	88%
ANL-E	$464,143	$463,043	100%
BNL	$231,102	$172,795	75%
FERMI	$280,004	$280,004	100%
LBNL	$338,338	$338,338	100%
ORNL	$1,108,114	$798,459	72%
PNNL	$520,149	$490,392	94%
PPPL	$71,130	$58,176	82%
SLAC	$149,159	$149,159	100%
TJNAF	$126,564	$93,027	74%
SC Totals:	**$3,338,098**	**$2,887,081**	**86%**
		DOE-Wide % Recycled:	*85%*

Table 9: 1999 Affirmative Procurement at SC Laboratories

Lab	Paper			Non-Paper Office Supplies		
	Total	**Recycled**	**% Recycled**	**Total**	**Recycled**	**% Recycled**
Ames	$37,665	$37,665	100%	$11,201	$5,494	49%
ANL-E	$274,844	$274,844	100%	$161,632	$161,632	100%
BNL	$70,563	$70,563	100%	$43,585	$43,585	100%
FERMI	$122,730	$122,730	100%	$87,562	$87,562	100%
LBNL	$231,263	$231,263	100%	$107,075	$107,075	100%
ORNL	$697,271	$554,681	80%	$274,815	$140,528	51%
PNNL	$313,871	$295,809	94%	$201,592	$193,897	96%
PPPL	$37,108	$32,431	87%	$16,967	$8,690	51%
SLAC	$116,454	$116,454	100%	$21,122	$21,122	100%
TJNAF	$68,834	$47,717	69%	$51,730	$39,310	76%
Subtotals:	$1,970,603	$1,784,157	91%	$977,281	$808,895	83%
Examples of paper products: copier, office and computer paper, coated paper, bristols, paperboard, packaging, facial and toilet tissues.				*Examples of non-paper products: binders, plastic desktop accessories, plastic envelopes, toner cartridges.*		

Table 10: 1999 Affirmative Procurement at SC Laboratories

Lab	Construction			Landscape		
	Total	Recycled	% Recycled	Total	Recycled	% Recycled
Ames	$529	$529	100%	$0	$0	NA
ANL-E	$17,087	$17,087	100%	$0	$0	NA
BNL	$55,200	$55,200	100%	$0	$0	NA
FERMI	$51,675	$51,675	100%	$0	$0	NA
LBNL	$0	$0	NA	$0	$0	NA
ORNL	$103,250	$103,250	100%	$0	$0	NA
PNNL	$4,000	$0	0%	$0	$0	NA
PPPL	$17,055	$17,055	100%	$0	$0	NA
SLAC	$11,583	$11,583	100%	$0	$0	NA
TJNAF	$6,000	$6,000	100%	$0	$0	NA
Subtotals:	$266,379	$262,379	98%	$0	$0	NA
Examples of construction products: insulation, cement and concrete containing ash or slag, structural fiberboard, laminated fiberboard, reprocessed latex paint.				*Examples of landscape products: garden and soaker hoses, hydraulic mulch, lawn and garden edging, yard trimmings compost.*		

Table 11: 1999 Affirmative Procurement at SC Laboratories

Lab	Vehicular			Transportation		
	Total	Recycled	% Recycled	Total	Recycled	% Recycled
Ames	$0	$0	NA	$0	$0	NA
ANL-E	$10,580	$9,480	90%	$0	$0	NA
BNL	$61,754	$3,447	6%	$0	$0	NA
FERMI	$10,137	$10,137	100%	$0	$0	NA
LBNL	$0	$0	NA	$0	$0	NA
ORNL	$32,778	$0	NA	$0	$0	NA
PNNL	$47	$47	100%	$639	$639	100%
PPPL	$0	$0	NA	$0	$0	NA
SLAC	$0	$0	NA	$0	$0	NA
TJNAF	$0	$0	NA	$0	$0	NA
Subtotals:	$115,296	$23,111	20%	$639	$639	100%
Examples of transportation products: channelizers, delineators, ,flexible delineators, parking stops, traffic barricades, and traffic cones.				*Examples of vehicular products: engine coolants, re-refined oils, retread tires.*		

Table 12: 1999 Affirmative Procurement at SC Laboratories						
Lab	**Park and Recreation**			**Miscellaneous**		
	Total	Recycled	% Recycled	Total	Recycled	% Recycled
Ames	$0	$0	NA	$0	$0	NA
ANL-E	$0	$0	NA	$0	$0	NA
BNL	$0	$0	NA	$0	$0	NA
FERMI	$0	$0	NA	$7900	$7900	100%
LBNL	$0	$0	NA	$0	$0	NA
ORNL	$0	$0	NA	$0	$0	NA
PNNL	$0	$0	NA	$0	$0	NA
PPPL	$0	$0	NA	$0	$0	NA
SLAC	$0	$0	NA	$0	$0	NA
TJNAF	$0	$0	NA	$0	$0	NA
Subtotals:	$0	$0	NA	$7900	$7900	100%
Example of Park and Recreation Products: plastic fencing.				*Example of Miscellaneous Products: pallets.*		

5.0 Toxics Release Inventory (TRI) Trends

Executive Order (EO) 12856 Compliance with Right-to-Know Laws and Pollution Prevention Requirements, obligates DOE to comply with the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986. The EO requires all federal agencies to reduce toxic emissions and off-site transfers to 50 percent of the 1993 baseline by December 31, 1999. DOE issued its strategy for meeting these requirements in December 1995. Businesses and government facilities that use more than 10,000 pounds/year of a listed toxic chemical must report transfers and releases to EPA.

Table 13 (Page 34) shows the releases and transfers of listed chemicals by SC sites from 1993-1999. Total Toxics Release Inventory (TRI) transfers and releases in 1996 were 85 percent below the 1993 baseline, a reduction that exceeds the Departmental reduction goals. Since then, SC's TRI releases have increased compared to the 1993 baseline: 1997 TRI transfers and releases increased 53 percent; 1998 TRI releases and transfers increased 267 percent, and 1999 TRI transfers and releases increased 295 percent. Trends in TRI reduction are not evident. Reported TRI releases reflect both ongoing operations, such as the replacement of ethylene glycol coolant at Fermi, and operations that vary with circumstances, such as the use of nitric acid in wastewater treatment at ORNL. ORNL's reported releases of nitrate compounds are a necessary component of its wastewater treatment. In 1997, ORNL was obligated to report the use of hydrochloric acid released from the burning of coal in its steam plant. Many laboratories decreased their TRI emissions completely, or reduced the quantities of TRI chemicals used to below reporting threshold. Zeros in Table 13 may indicate that emissions were totally eliminated or that the quantities of the TRI chemical fell below the reporting threshold of 10,000 pounds per year.

The TRI releases do not necessarily signify harm to the environment. ORNL was obligated to report the quantities of nitric and hydrochloric acids used for wastewater treatment as a release even though all discharges to the environment were within the laboratory's National Pollutant Discharge Elimination System (NPDES) limits. Similarly, ORNL's reported lead transfers are an indication of the beneficial re-use of lead in the on-site lead shop. The ORNL lead shop is supporting reuse, reshaping, and recycling of lead for numerous DOE sites. Off-site transfers and slag from remelting are reported on the TRI form, despite the fact that these activities prevent the generation of large amounts of hazardous lead waste.

Table 13: SC TRI Chemical Releases to the Environment, 1993-1999
Quantities in Pounds--Data Not Validated Against Envirofacts

Lab	Chemical Name	1993 Releases & Transfers(a)	1994 Releases & Transfers(a)	1995 Releases & Transfers (a)	1996 Releases & Transfers (a)	1997 Releases & Transfers (a)	1998 Releases & Transfers (a)	1999 Releases & Transfers (a)	Percent Change 1998-1999	Percent Change 1993-1999
ANL-E	1,2,4-Trimethylbenzene	29	9	0	0	0	0	0	NA	-100%
	Benzene	23	5	0	0	0	0	0	NA	-100%
	Methanol	12	18	0	0	0	0	0	NA	-100%
	Methyl-tert-butyl Ether	86	5	0	0	0	0	0	NA	-100%
	*Sulfuric Acid	7	2,400	--	--	--	--	0	NA	-100%
	Toluene	144	10	0	0	0	0	0	NA	-100%
	Xylene (Mixed Isomers)	144	20	0	0	0	0	0	NA	-100%
BNL	Acetone	1,930	2,030	0	0	0	0	0	NA	-100%
	Chlorine	170	466	250	0	0	0	0	NA	-100%
	Methanol	2,110	1,860	1,858	0	0	0	0	NA	-100%
	*Sulfuric Acid	330	0	--	--	--	--	0	NA	-100%
	1,1,1-Trichloroethane	1,105	0	0	0	0	0	0	NA	-100%
Fermi	Asbestos	0	0	0	0	0	0	1,000	NA	NA
	1,2,4-Trimethylbenzene	72	8,553	460	7,020	0	0	821	NA	1040%
	Hydrochloric Acid	76	450	40	0	0		0	NA	-100%
	Bromotrifluoromethane	0	318	262	167	0		0	-100%	NA
	Ethylene Glycol	1,209	1,070	1,441	1,000	3,528	1,740	558	NA	-100%
	Trichlorofluoromethane	1,800	0	0	650	0	0	0	NA	-100%
ORNL[c]	Chlorine	7,146	0	0	0	0	0	0	NA	-100%
	Copper Compounds	0	0	0	0	348	0	1590	NA	NA
	Hydrochloric Acid	0	0	81	0	46,508	49,123	52,603	7%	NA
	Lead	0	0	5,930	3,751	6,816	5,346	11,723	119%	NA
	Mercury	0	0	0	0	0	0	712	NA	NA
	Methanol	164	0	272	107	436	906	517	-45%	215%
	Nitrate Compounds	0					64,000	62,000	-100%	NA
	Nitric Acid	43	0	31,422	1	129	1204	0	-100%	-100%
	*Sulfuric Acid	0	1	--	--	--	--	--	NA	NA
	Tetrachloroethene	0	0	0	0	0	0	0	NA	NA
SLAC	1,1,1-Trichloroethane	12,700	16,300	0	0	0	0	0	NA	-100%
	*Sulfuric Acid	4,000	12,600	--	--	--	--	0	NA	-100%
	SC TOTAL:	33,300	46,115	42,016	5,676	57,765	122,319	131,524	**8%**	**295%**

(a) Include non-point air releases, point air releases, water releases, underground injection releases, land releases, and total off-site transfers for treatment and/or disposal.
(b) Percent change - negative number equals % decrease, positive number equals % increase. N/A is not applicable.
(c)Data not validated by laboratory. *Sulfuric acid is not subject to reporting after 1994

6.0 SC Pollution Prevention Funding

Executive Orders EO 13101 and 13148 require all federal agencies to formulate and fund pollution prevention activities. Funding for pollution prevention activities is requested in the Federal Agency Pollution Prevention and Abatement Planning Process and through agency budget requests.

Pollution prevention activities are funded through SC programs, EM, and site overhead. These combined funds have enabled SC laboratories to meet or exceed DOE's pollution prevention goals. (See Appendix A for pollution prevention accomplishments by laboratory.)

Pollution prevention is a functional area of the Environment, Safety, and Health (ES&H) Management Plan. Table 14 shows pollution prevention funding referenced in SC's Activity Data Sheets (ADS) from the FY 2000 ES&H Management Plan. Pollution prevention funding by SC Program is presented in Table 15 (Page 36) and Figure 27 (Page 37). These figures represent SC's planned funding for pollution prevention and waste minimization activities; the actual funding received and expended may be different.

Table 14: Pollution Prevention Funding from SC
Figures from the FY 2001-2005 ESH&I Management Plan

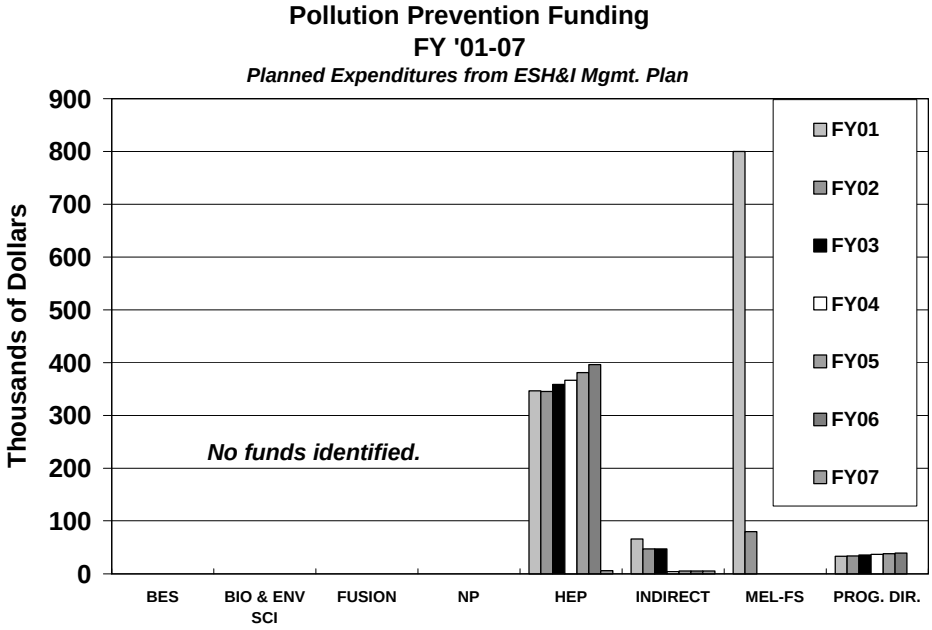
Facility	No. of ADSs	Total Dollars (Thousands)		
		FY' 01	FY' 02	FY'03
Ames[1]	0	0.0	0.0	0.0
ANL-E[1]	0	0.0	0.0	0.0
BNL	2	818.9	50.2	50.2
Fermi	3	337.5	336.2	349.4
LANL[1]	0	0.00	0.00	0.00
LBNL[1]	0	0.00	0.00	0.00
ORISE	1	5.60	5.80	5.80
ORNL[2]	2	82.8	114.0	35.2
PNNL	0	0.0	0.0	0.0
PPPL[1]	0	0.0	0.0	0.0
SLAC[1]	0	0.0	0.0	0.0
TJNAF[1]	0	0.0	0.0	0.0
TOTALS:	**8**	**1,244.8**	**506.0**	**440.6**

[1] No ADSs with funds allocated to pollution prevention were identified.

[2] ADS at ORNL were identified as Oak Ridge Operations Office.

Table 15: Pollution Prevention Funding by SC Program Dollars in Thousands												
Lab	**High Energy Physics**			**Indirect**			**MEL-FS**			**Program Direction**		
	FY01	FY02	FY03	FY01	FY02	FY03	FY01	FY02	FY03	FY01	FY02	FY03
Ames												
ANL-E												
BNL	3.2	3.2	3.2	65.7	47.0	47.0	750.0	0.0	0.0			
FERMI	337.5	336.2	349.4									
LBNL												
ORNL							50.0	80.0	0.0	32.8	34.0	35.2
ORISE	5.6	5.8	5.8									
PNNL												
PPPL												
SLAC												
TJNAF												
TOTALS:	**346.3**	**345.2**	**358.4**	**65.7**	**47.0**	**47.0**	**800.0**	**80.0**	**0.0**	**32.8**	**34.0**	**35.2**

Figure 27


Pollution Prevention Funding
FY '01-07
Planned Expenditures from ESH&I Mgmt. Plan
Thousands of Dollars
900
800
700
600
500
400
300
200
100
0
No funds identified.
FY01
FY02
FY03
FY04
FY05
FY06
FY07
BES
BIO & ENV SCI
FUSION
NP
HEP
INDIRECT
MEL-FS
PROG. DIR.

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Appendix A

1999 Pollution Prevention Accomplishments at SC Laboratories

Argonne National Laboratory (ANL-E)

ANL-E conducted 37 pollution prevention projects in 1999, which reduced waste by **8,594 metric tons**, for estimated savings and cost avoidance of **$762,712.** Examples of specific projects include:

Recycling

- ANL-E sold 470 metric tons of coal fines to PFS-US for recycling, for savings of $14,531.

– ANL-E shipped 27 metric tons of sanitary sludge to Dupage County to be recycled into methane for electricity generation. Estimated savings from avoided purchase and disposal costs are$64,800.

- Argonne shipped 23.65 metric tons of used oil to Safety-Kleen for rerefining.

- Other quantities recycled:
  - 19.14 metric tons of lead for estimated savings of $33,000.
  - 3 tanks of alkali metals, 3 of lithium metal, and 9 of sodium metal for savings of $10,500.
  - 9.39 metric tons of mercury-containing fluorescent light bulbs.
  - 6.52 metric tons of lead-acid batteries, for savings of $2,500
  - 2,266 metric tons of construction materials for savings of $68,032
  - 827 metric tons of scrap metals, for savings of $88,509.
  - 0.8 metric tons of toner cartridges for $2000
  - 561 metric tons of fly ash, for savings of $13,365.

Reuse

- ANL-E used the DOE Complex-Wide Material Exchange to obtain items such as an ultrasonic cleaner, rare earth metals, lead shot, and a soil venting halocarbon destructor for cost savings of $301, 500.

- ANL-E shipped surplus rare earth chemicals to Ames Laboratory, saving DOE $42,000.

- ANL-E used the DOE Complex-Wide Material Exchange to transfer:
  - a glove box worth $5000 to PPPL
  - eight bar code scanners worth $1000 to ORNL

Waste Minimization

- ANL-E completed Phase I of the Green Solvent Pollution Prevention Opportunity Assessment. VersolTM ethyl lactate was assessed. It is known to have good cleaning and solvating properties, and is non-toxic, completely biodegradable, and easily recovered. The laboratory initiated Phase II of the Green Solvent Pilot Study and began evaluation of Versol Gold, a soy and corn-based blended solvent developed at ANL-E.

- ANL-E replaced an outdated Polaroid system with a Leitz metallograph digital camera system. Savings from labor reduction, decreased waste generation and water usage, and health and safety costs are estimated at $6000 in 1999.

- The laboratory placed a waterproof rubberized membrane on an existing chilled water storage tank at the Advanced Photon Source. The installation of the membrane reduced biological growth in the system, thereby reducing the need for biocides. Estimated cost savings are $10,000.

Brookhaven National Laboratory (BNL)

BNL conducted five pollution prevention projects in 1999, which reduced waste by **17 metric tons** for estimated savings and cost avoidance of **$147,000**. Examples of specific projects include:

Recycling

- BNL arranged to have a vendor take back exit signs that contain tritium, eliminating the generation of LLW.

Reuse

- BNL offered approximately 1,800 gallons of excess paint to non-profit organizations in the surrounding community. The paint will be used for low-income housing and other projects instead ending up as waste.

- Radioactively contaminated roofing was used as void space filler for the packaging of radioactive waste bins, which avoided both the generation of waste and purchase of packing material.

Fermi National Accelerator Facility (Fermi)

Fermi conducted 6 pollution prevention projects in 1999, which reduced waste by **184 metric tons**, for estimated savings and cost avoidance of **$38,591**. Examples of specific projects include:

Recycling

- Fermi's recycling activities include:
  - recycling of 83.9 metric tons of paper
  - recycling of 46 metric tons of unused lead into shielding
  - waste paper, cardboard, shipping pallets and outdated computer monitors were recycled
  - a steel tank contaminated with depleted uranium was decontaminated so that it can be recycled as scrap
  - expansion of the scrap metal recycling program

Waste Minimization

- Fermi purchased a high heat muffle furnace to perform radiation analysis on concrete samples. The furnace eliminates an acid digestion process, which creates mixed waste.

Lawrence Berkeley National Laboratory (LBNL)

LBNL conducted 11 pollution prevention projects in 1999, which reduced waste by **405 metric tons** for estimated cost savings and cost avoidance of **$1,742,620.** Examples of specific projects include:

Recycling

- LBNL initiated closed-loop recycling of Coomasie Blue stain solution in the Physical Biosciences laboratories

- LBNL removed two kilograms of activated metal from the Building 51 beam pipe, allowing 250 kg of nonradioactive steel to be recycled, for cost savings of $3000.

Reuse

- LBNL shipped lightly activated concrete shielding blocks to BNL for reuse in the Relativistic Heavy Ion Collider

- LBNL shipped 30 milligrams of Californium-249 to ORNL for reuse.

Waste Minimization

- LBNL installed spray controller units on Building 77 cleaning tanks, reducing water usage, chemical usage, sludge generation, and operator time, for savings of $32,000.

- Five new chemical imaging and labeling devices were installed across the facility, reducing hazardous waste generation, low level wastes and photochemical wastes. Estimated savings are $89,000.

- Three oilless pumps were installed at the Building 88 accelerator, reducing the generation of mixed wastes for savings of $4,500.

- LBNL trained several new mixed waste generators to allow benchtop treatment of liquid corrosive mixed waste. This treatment converts mixed waste to low-level waste for savings of $3000.

Oak Ridge National Laboratory

ORNL conducted 18 pollution prevention projects in 1999, which reduced waste by **54,607 metric tons**, for estimated savings and cost avoidance of **$757,851.** Examples of specific projects include:

Recycling

- ORNL sold 2,400 gross tons scrap metal and equipment to a vendor licensed for processing radioactive material for recycling. Savings are estimated to be $20,000.

- ORNL shipped the Molten Salt Reactor Experiment (MSRE) Steam Domes to an off-site vendor for recycling, saving $32,262.

- ORNL recycled the following quantities:
  - 302 metric tons of mixed paper
  - 40.6 tons of aluminum cans
  - 23 tons of toner cartridges
  - 0.3 tons of Styrofoam peanuts
  - 1.6 tons of laboratory waste
  - 1552 tons of scrap metals
  - 45 tons of used oil
  - 79 lead acid batteries
  - 14,119 tons of coal ash

Reuse

- Purchase of reusable Personal Protective Equipment is avoiding 385 cubic feet of PPE waste, for savings of $55,400.

- ORNL shipped 130 gallons of heavy water from the Bulk Shielding Facility at ORNL to Y-12 for reuse.

Waste Minimization

- ORNL gained regulatory approval to consolidate contaminated soils and sediments under proposed burial ground caps, avoiding transportation and disposal costs.

- Improvement to ORNL's water system reduced chiller maintenance, extended the life of equipment, minimized drum disposal and reduced blowdown to waste streams by 21,272,000 gallons, saving $500,000 annually in utility costs.

- The Central Training Facility converted the live-fire shoot house to non-lead ammunition for immediate savings of $11,250.

- Use of the Accel-a-Writer eliminated an old photographic process for producing metal signs, reducing waste by 8 metric tons and saving $58,352 per year.

- The Re-Entry Cleaning System for Circuit Boards replaces systems using Freon and aerosol cans, and reduces solvent use by 99%. Yearly savings are estimated to be $23,623.

- An oil-free vacuum pump was installed in the Physics Division.

- Twelve RCRA wells were converted to micro-purge sampling, reducing waste by 2 metric tons per year.

- Purchase of a new radiograph system avoids generation of 15,768 cubic meters of wastewater per year.

Pacific Northwest National Laboratory (PNNL)

PNNL conducted 32 pollution prevention projects in 1999, which reduced waste by **200 metric tons** for estimated savings and cost avoidance of **$1,507,306**. Examples of specific projects include:

Recycling

- Janitors recycle aluminum cans, and retain the funds for their effort.

- PNNL recycled the following materials:
  - lead acid and gel batteries
  - waste oil
  - transparencies
  - 373 used toner cartridges
  - 1536 lbs. of obsolete phonebooks
  - 11 tons of obsolete software and manuals
  - 87 metric tons of white paper
  - 27 metric tons of cardboard
  - 0.27 metric tons of glass
  - 0.13 metric tons of tin
  - 0.24 metric tons of plastic

Reuse

- PNNL redistributed 1,200 lead bricks, bio-hazardous bags, and 40 cases of RTV sealant for reuse.

- Formalin, alcohol, xylene, and methanol were reused for savings of $53,251.

- Six new marine batteries were shipped to the Battelle Marine Science Laboratory

- Twenty-five 5-gallon cans of injection molding resin pellets were donated to Central Washington University.

- Gasoline vapor was condensed for reuse.

- Chemical drums that would become hazardous waste are returned to the vendors for reuse.

- Saturated filters for water treatment were regenerated and reused.

Waste Minimization

- In buildings 337 and 325, PCB-contaminated ballasts were replaced with clean T8 electronic ballasts, for energy savings costs of $86,491.

- A mechanical method of stripping silicone coatings from equipment eliminated the use of xylene solvents.

- Digital photography has eliminated the need to develop film.

- Oils are not changed until it is necessary, reducing the generation of mixed low-level waste, and saving $11,613.

- Purchase of pre-treated microscope slides eliminates the need to purchase a hazardous coating solution.

- Development of a gas chromatographic method for protein studies replaced a radiological method, eliminating 165 gallons of low-level waste annually.

- Electronic submission of resumes for internal job posting prevents the generation of .02 metric tons of waste per year.

- Printed corporate reports were replaced by electronic ones on a shared drive.

Princeton Plasma Physics Laboratory (PPPL)

PPPL conducted 32 pollution prevention projects in 1999, which reduced waste by **791 metric tons** for estimated savings and cost avoidance of **$61,988,631.** Examples of specific projects include:

Recycling

- PPPL reused buildings, systems, and equipment in the construction of the National Spherical Torus Experiment. Systems reused include the neutral beam, vacuum pump, Ion Cyclotron Radio Frequency and Poloidal Magnetic Field system.

- PPPL recycled the entire Princeton Large Torus, consisting of 110 tons of copper, 99 tons of stainless steel, and 3 tons of insulation for savings of $51,500.

- PPPL recycled the following materials:
  - 4,365 of scrap computer monitors
  - 800 fluorescent ballasts
  - 344 lbs. of PCB ballasts
  - 1,785 lbs. of non-PCB ballasts
  - 532 lbs. of capacitors
  - 75,491 lbs. of lead
  - 7,177 lbs. of FREON
  - 182 toner cartridges
  - 17 metric tons of mixed papers
  - iron
  - tin
  - steel
  - wood
  - fluorescent lamps
  - lead-acid batteries
  - nickel-cadmium batteries
  - aluminum cans
  - glass bottles
  - scrap metals
  - cardboard
  - computer scrap
  - wire
  - concrete

Reuse

- Gloves used in decontamination and decommissioning are being washed and reused for savings of $16,955 per year.
- The Diamond Wire Cutting demonstration reused 11 tons of stainless steel, 4 tons of 718 inconel, and 400 carbon tiles were reused for savings of $160,000.
- PPPL reuses crushed glass scintillation vile bottles as void space filler in the shipment of LLW, avoiding both disposal costs for the bottles and purchase of void space filler.

Waste Minimization

- Digital control of air handling saved 320,540 kilowatt hours, preventing generation of 512,540 tons of carbon dioxide.

- Use of the Compressed Natural Gas fast fill system allowed expanded use of CNG/gasoline vehicles, saving $4,103 per year.

- Parts cleaning systems reduce the use of solvent degreasers, eliminating the needs for over 600 spray cans for savings of $9,500 per year.

- Micropurging of groundwater monitoring wells prevents generation of 62 cubic meters of waste, for savings of $100,000.

Stanford Linear Accelerator Center (SLAC)

Stanford conducted 3 pollution prevention projects in 1999, which reduced waste by **61 metric tons**, for estimated savings and cost avoidance of **$106,000**. Examples of specific projects include:

Recycling

- SLAC recycled 52 tons of electrical equipment, including transformers and circuit breakers for estimated saving and cost avoidance of $60,000.
- SLAC eliminated 9 tons of hazardous waste through better waste packaging, recycling of empty chemical containers, and returning gas cylinders containing hazardous materials to vendors for savings of $46,000.
- SLAC installed recycling containers throughout its sites.

Waste Minimization and Pollution Prevention

- Installed and started operation of a closed-system vapor degreaser to reduce emissions of ozone-depleting solvent.